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[54] **FOLDED-OVER PILOT BURNER**

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[52] **U.S. Cl.** ..... **60/39.36**; 60/39.65; 60/39.82 P

[58] **Field of Search** ..... 60/39.36, 39.82 P, 39.65

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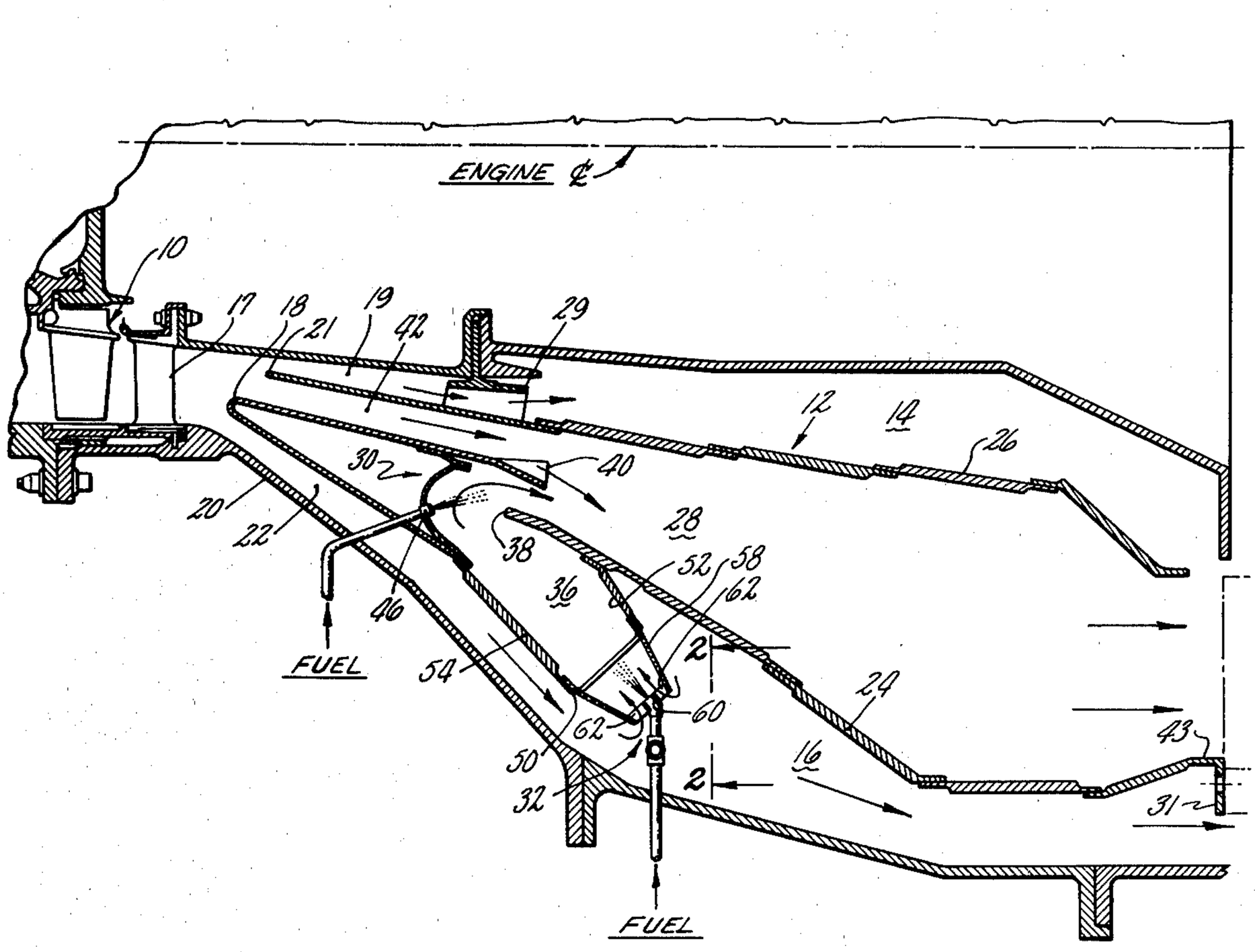
[57] **ABSTRACT**

The pilot burner for a high M_N inlet burner is folded to substantially reduce the overall length of the combustor. The annular burner includes a splitter design where a diffuser surrounds the burner and connects to an outer shroud which contains the inlet of the pilot burner. Flow reverses into the pilot burner where it is directed to the primary burning zone of the combustion chamber.

6 Claims, 2 Drawing Figures



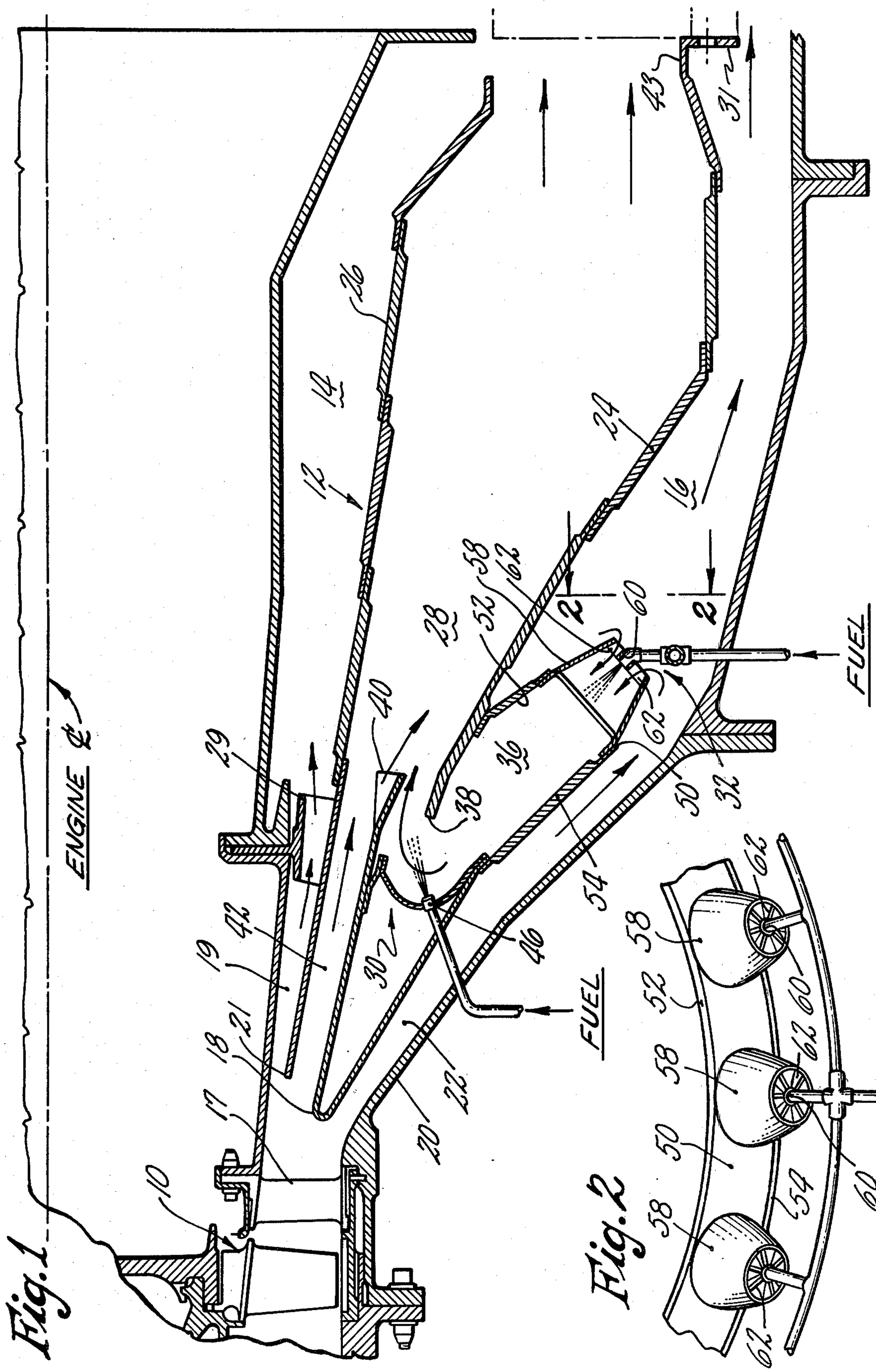

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Fig. 1

Fig. 2

FOLDED-OVER PILOT BURNER

BACKGROUND OF THE INVENTION

This invention relates to gas turbine engines and particularly to its combustion section.

Within the confines of burner efficiency, allowable pressure drop and the temperature of the gas at the inlet of the turbine, the length of the burner, whether annular can or combination thereof is kept to a minimum. Obviously, the length of the burner has a direct bearing on the size of the engine case and the engine's overall length, all of which obviously bears on the engine's installed weight. For aircraft application it is of paramount importance to hold the thrust per pound of engine at as high a value as possible.

Furthermore in a high M_N airflow engine, struts in the gas path along the diffuser-burner area cannot be used inasmuch as it has an adverse affect on the airflow.

We have found that we can reduce the length of heretofore known efficient burners without deteriorating any of the other operating criteria by folding the pilot burner which in turn results in stiffer rotor or rotors, a reduction in engine length and a consequential reduction in installed engine weight.

SUMMARY OF THE INVENTION

A feature of this invention is to fold the pilot burner of a high M_N inlet burner. An annular pilot burner located in the outer shroud reverses the flow discharging from the diffuser where fuel admitted thereto is combusted prior to being admitted into the primary zone of the engine's main annular burner. The shortened burner eliminates the need of support struts in the gas path in the normal diffuser-burner area that heretofore were necessary for support resulting in a reduction in total engine length and installed engine weight.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a partial view of a burner employing this invention.

FIG. **2** is a partial end view of the pilot burner.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As can be seen from FIG. **1** the air discharging from compressor **10** (one blade being shown) is proportioned so that a given amount is admitted into the burner generally indicated by reference numeral **12**, inner annular passageway or shroud section **14** and outer annular passageway or shroud section **16**. A ring of stator blades **17** is mounted aft of the compressor blades and as is conventional, straighten the compressor discharge air to some degree. Splitter **18** at the entrance of burner **12** defines with casing **20** diffuser passage **22** serving to lead compressor air in the outer shroud section, while diffuser passage **19** serves a similar purpose for the inner shroud section. The walls of splitters **18** and **21** define the inlet passage **42** to the main burner.

The annular burner is fabricated in the conventional manner either from louver lining elements or Finwall ® liner elements that are attached end-over-end defining an outer annular wall **24** and an inner annular wall **26**, spaced from each other to define the annular combustion zone **28**. The inner liner wall **26** is supported by the vane **29** and the outer liner wall **24** is supported to the turbine structure (not shown) at flange **31**. The combustion section includes the main burner generally indicated by reference numeral **30** and the pilot burner generally indicated by reference numeral **32**. Each burner comprises suitable commercially available fuel nozzles (one being shown for each) and operate in the conventional manner. As noted in this configuration combustion air is admitted into the pilot burner **32** after discharging from diffuser **22** by first reversing its flow relative to the gas flow path in the main combustion section. This fuel/air mixture burns in the pilot burner zone **36** and discharge into the main combustion zone **28** by reversing again at the main zone entrance **38**. Mixer **40** is mounted at the end of passage **42** for violently mixing the compressor discharge air in that passage and the fuel/air mixture discharging from the pilot burner. The products of combustion pass axially through combustor **28** and exit at **43** into the inlet of the turbine (not shown). Fuel to the main combustion zone is fed through nozzle **46** and may take the form of any well known fuel nozzle.

As can be seen in FIG. **2** the fuel nozzles on the pilot burner are circumferentially spaced about the periphery of the annular opening **50** defined by the inner annular walls **52** and the outer annular wall **54**. Each nozzle consists of a generally cylindrical outer wall **58** and a concentric cylindrical inner wall **60** having a plurality of air turning vanes **62**. Fuel is admitted into the central bore defined by inner wall **60**.

By virtue of the configuration for a given burner performance, it was ascertained that the overall length of the combustor can be reduced at least 4 inches which is considerable when viewed in terms of overall engine weight.

It should be understood that the invention is not limited to the particular embodiments shown and described herein, but that various changes and modifications may be made without departing from the spirit or scope of this novel concept as defined by the following claims.

We claim:

1. An annular burner for high Mach number airflow for a turbine type power plant including an inner generally axially extending wall defining an inner wall liner section, an outer generally axially extending wall spaced from said inner wall defining an outer wall liner section and together therewith defining a main combustion zone, an inner and outer casing coaxially mounted relative to each other and defining a space for receiving said inner and outer wall liner sections, each being spaced therefrom for defining an inner shroud passageway and an outer shroud passageway, the inner and outer wall liner sections being substantially closer at its fore end relative to its rear end and having an inlet passage for receiving compressor discharge air and being in substantially axial alignment, splitter means at the inlet forming a portion of said inlet passage for proportioning some of said compressor discharge air into the inner and outer shroud passageways, a pilot burner disposed in said outer shroud passageway having an inner wall and an outer wall spaced from each other defining an annular passageway surrounding and being common to a portion of said outer wall liner section, said inner and outer wall of said pilot burner terminating intermediate the ends of said main combustion zone and defining an annular inlet for receiving compressor discharge air from said outer shroud passageway flowing in a reverse relationship to the normal flow of the main combustor working medium, at least one fuel nozzle at the inlet of said pilot burner, an exit end sub-

stantially at the forward end of said pilot burner and means for reversing the flow of pilot burner exhaust into said main combustion zone for flowing axially with said working medium.

2. An annular burner as in claim 1 including a diffuser passage intermediate the forward end of said splitter in relation to the normal flow of said working medium and the inlet of said pilot burner.

3. An annular burner as in claim 2 including a mixer mounted at the exit end of the inlet passage to said main combustion zone and the inlet receiving pilot burner exhaust to said main combustion zone.

4. An annular burner as in claim 3 including at least one fuel nozzle for directing fuel into said main combustion zone facing said inlet receiving pilot burner exhaust to said main combustion zone.

5. An annular burner as in claim 3 including a plurality of fuel nozzles circumferentially spaced about said pilot burner at the inlet thereof.

6. An annular burner as in claim 5 wherein each of said fuel nozzles includes a central opening for receiving fuel and a plurality of vanes spaced about said central opening for receiving compressor air for mixing with said fuel for burning in said pilot burner.

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